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d) Pictures. Photographs colored and uncolored; paintings; drawings; slides. Selection of type pictures of earth forms; industries; homes; people. Places for obtaining pictures.

5. Expression. Sand-modeling, chalk-modeling, painting and drawing. Relation of expression to observation, to memory. Value of landscape drawing in black and white; in colors. Creative work in geographic drawing. Skill in graphic expression necessitated for teaching geography.

6. The basis for the selection of a curriculum for the elementary and secondary schools: Culture; utility. At what age should the study of geography begin? When end? Why? When are children naturally interested in industrial geography; in political geography; in physical geography; in biogeography; in ethnogeography? What phases of geography, if any, should continue through the elementary and the secondary schools? How much of the world's geography should be covered in the teaching of physiography in the high school? What relation should be maintained between history and geography in the elementary and secondary schools? What influence should the world's current events have upon the selection of subjects of study? What influence should local changes—meteorologic, physiographic, and cultural—have upon the daily program? How can geography be made a study of principles rather than a study of facts? Laws which govern topographic forms; climate; distribution of vegetation and animals; distribution of cities; products; commerce. When should a child be made conscious of the principles underlying geographic facts?

MATHEMATICS.

PROFESSOR MYERS.

WHATEVER may be said concerning the pedagogy in general of the recent past, the most obvious, if not the most flagrant, fault of recent mathematical pedagogy is its fragmentary character. It fails signally to recognize the important pedagogical discovery of a few years since, that the whole boy comes to school. Time forbids entering here upon the philosophy of the origin of this patent fault, though reasons for its prevalence among us would not be far to seek. But in this age of pedagogical stir phenomena are being thrown to the surface of the educational waters too rapidly to be accounted for; we are able only to take account of them, and to explain what we mean when we think we see one. For the present, therefore, we shall be content with a few words of explanation of what we mean by the statement that the most telling weakness of recent mathematical pedagogy is its fragmentariness.

With the general enrichment and consequent disturbance of the elementary and secondary curricula through the introduction of the modern subjects, mathematics has for a long time been playing at "Pussy wants a corner." She is still passing nervously from neighbor to neighbor in the general scram-

ble for a "corner." Here is an educational writer who would crowd her into the corner with nature-study, or even with elementary meteorology or soil study; another says she must make shift with geography; another with manual training; another with the industries of the home; another with those of the farm or workshop; another with business; another with physics; and so on *ad libitum*. Each prepares a text showing that he has found the true place of mathematics. From the standpoint of the content of mathematics there are those who tell us that mathematics is counting; others that it is measuring; and others still that it is the science of establishing a correspondence, one by one, of things or ideas about things. Finally, there are still others who believe it is all of these things and more too. The writer believes, with others, that it is the science which has to do with the entire quantitative side of the life of the individual.

The mathematical work of all departments of the School of Education is based upon this idea, and the course in the pedagogy of elementary mathematics which follows is intended to give any persons who desire an opportunity to see with what success or lack of success this idea is followed out in the Elementary School of the School of Education.

134. PEDAGOGY OF ELEMENTARY MATHEMATICS.

The following course in elementary mathematics will be offered during the summer quarter:

First three weeks.—This will comprise a general presentation of the work in mathematics throughout the Elementary School. Such an exposition as time permits of the principles controlling the work and of the relations of mathematics to the other subjects of the elementary curriculum will be given.

Second three weeks.—The second three weeks will be given to a more detailed study of the special mathematical topics and methods of presentation for the primary grades. The study will descend into particulars as to problems and teaching plans, to whatever extent the brief time permits.

Third three weeks.—The matter and method of treating mathematics in the grammar school will receive chief emphasis during this term. Laboratory and field-work in mathematics suitable for the grammar grades will be given considerable attention.

Fourth three weeks.—This period of time will be given to the consideration of the matter and manner of mathematical teaching required to make the transition from the elementary to the secondary school easy and natural to the pupil. It will concern itself with the closing work of the grammar-school and the beginning work in high-school mathematics.

135. ELEMENTS OF SURVEYING.

This course aims at giving the student a working familiarity with the customary instruments of plane surveying, some degree of skill in the use of

these instruments, together with a knowledge of the typical problems of the surveyor and civil engineer and the ability to solve these problems. The work will consist of field-work, the taking of field notes in good form, the reduction and discussion of these notes, trigonometric computations by logarithms with and without the slide rule, and the drawing of topographic and profile maps. The pedagogic order will be from the field tract, or course, to the concise description by word and sketch of the salient features of the proposed problems, through the geometrical representation of the problem to its solution, and, finally, the return to the field by a careful interpretation of the meaning of the results. It is believed that one of the values of the course will be to show secondary mathematical teachers many ways in which, with inexpensive apparatus, the elements of surveying may be used in their classes.

Among the problems to be solved will be included the following :

1. Study of the length of the pace under a variety of conditions influencing it.
2. Measurement of distances, free and obstructed, by pacing, by chaining, and by the steel tape.
3. Measurement of angles by chain, by tape, by compass, and by transit.
4. Problems with the compass and transit.
5. Determination of areas from measured data by the methods of engineering practice.
6. Differential and profile leveling.
7. Contour leveling.
8. Determination of heights.
9. Staking out buildings.
10. Surveys with plane table and stadia.
11. Surveys with tranist and stadia.
12. Areas by latitudes and departures.
13. Triangulation.

The prerequisites for admission to this course are reduced to a minimum. Any applicant who has completed high-school algebra and geometry (including solid geometry), who can show ability to use the six trigonometric ratios, and can compute by logarithms will be admitted to the work of the first term. For admission to the work of the second term of the quarter a knowledge of plane trigonometry, or the work of the first term, will be required. Minor credit will be given for the satisfactory completion of the work of either term, and major credit for both.

136. HISTORY OF THE TEACHING OF ELEMENTARY AND SECONDARY MATHEMATICS.

This course will be given in the summer quarter, in case there seems to be a sufficient demand for it. If, however, it is given, course No. 135 will not be given.

It will have to do with the historical order of ideas that have dominated the teaching of arithmetic, geometry, algebra, and trigonometry in the past. It will undertake to point out the influences which prepared for and shaped the reforms of the past as to method and matter in this teaching, with the view to rendering the modern teacher more intelligent as to what promises improvement today and to economizing his efforts to improve his own teaching. A knowledge of the traditions and influences which have shaped the past teaching of one special subject renders one capable both of valuing these influences at their true worth and of breaking with them when they become an obstruction to his progress. His respect for them is not the superstitious awe of ignorance, but is the intelligent respect for the consensus of the accumulated opinions of the past, which may or may not have an important bearing on present-day pedagogical movements. The practice of any teacher is both steadied and liberated by some knowledge of how his special subject came into its present state and relation in the school. Attention will be focused mainly upon the bearing of the history of mathematics upon current teaching.

The course will be given by text-book, lectures, and library references. It will run through the quarter and will count for major credit. Trigonometry will be required for admission to it.

SPEECH, ORAL READING, AND DRAMATIC ART.

ASSOCIATE PROFESSOR FLEMING.

COURSE I. GENERAL COURSE FOR TEACHERS IN ELEMENTARY AND SECONDARY SCHOOLS. OPEN TO ALL TEACHERS.

Expression is a social function. The school gives ideal conditions for acquiring power in expression, and it should be organized to give the child ample opportunity to use this power for the good of the whole community.

I. *Expression*.—Expression is the natural result of all thinking, and, when controlled by the will, becomes a means of image-growth. It is habit-forming. It is character-making. Expression has three functions: first, its physical function, the training and growth of the body; second, its intellectual function, reaction upon thought; third, its moral function, the development of motive and the training of the emotions. These are in reality one in action. Any attempt to separate them is fatal to all.

Expression is a necessity of growth, a revelation of power, of one's largest self and highest possibilities. Definite, clear thinking produces definite, clear expression. Vague, indefinite thinking produces vague, indefinite expression. It is uncertainty that paralyzes.

Each mode of expression has its own particular reactive function. Form, necessary to any clear imaging, is realized by the plastic arts, a closer